

Volume 4. Aircraft Equipment and Operational Authorizations

CHAPTER 8. GROUND DEICING/ANTI-ICING PROGRAMS

SECTION 1. GENERAL

1683. BACKGROUND. Section 1 of this chapter contains background information on ground deicing/anti-icing of aircraft. Section 2 provides policy, direction, and guidance to Federal Aviation Administration (FAA) inspectors for evaluation and approval of operator procedures. Volume 6, chapter 2, section 10, of this handbook covers ground deicing/anti-icing surveillance procedures. There are essential differences in the ground deicing/anti-icing requirements of Title 14 of the Code of Federal Regulations (14 CFR) parts 121, 125, and 135. For example, part 121 requires a complete deicing/anti-icing program that includes the training and testing of all personnel involved in the ground deicing/anti-icing process. On the other hand, part 135 requires training and testing for pilots only. Additionally, if a part 135 operator chooses to use personnel other than pilots to assist in the ground deicing/anti-icing and verification process, then those individuals must receive adequate and appropriate training. Part 125 requires testing for pilots only; however, other personnel involved in the deicing/anti-icing process must receive adequate and appropriate training. Part 125 and 135 operators have the option to elect to meet the deicing/anti-icing requirements of section 121.629(c) and institute a full deicing/anti-icing program. Recognizing that most inspectors will be required to inspect a variety of aircraft and operators, this chapter will attempt to present the differences in a meaningful manner. The inspector should become thoroughly familiar with the differences and requirements in 14 CFR covering operations in icing conditions.

1685. RULE. The current regulations in parts 121, 125, and 135 prohibit a takeoff when frost, ice, or snow (contamination) is adhering to the wings, control surfaces, or propellers of an airplane (See sections 121.629(b), 125.221(a), and 135.227(a)). Traditionally, the pilot-in-command (PIC) has been held responsible for ensuring that critical surfaces of the aircraft are free of adhering frozen contaminants before takeoff. By the winter of 1991, an analysis of air carrier accidents led the FAA to conclude that many PICs had not been provided with sufficient information to ensure that the aircraft is free of frost, ice, and snow. Part 121 was amended in November 1992, and parts 125 and 135 were amended in January 1994 to provide specific rules for operating (that is, taking off) in weather conditions

when frost, ice, or snow could reasonably be expected to adhere to the aircraft (ground icing conditions).

1687. PART 121 GROUND DEICING/ANTI-ICING.

A. General. 14 CFR section 121.629(b) prohibits takeoff when contamination is adhering to critical surfaces of an airplane or when takeoff would not be in compliance with section 121.629(c). The exception to that general rule is that the Administrator may approve takeoff with “frost under the wing in the area of the fuel tanks.” Section 121.629(c) requires a detailed, comprehensive, deicing/anti-icing program (part 121 ground deicing program) if a certificate holder is going to operate “any time conditions are such that frost, ice, or snow may reasonably be expected to adhere to the aircraft” (ground icing conditions). Section 121.629(d) provides a means for a certificate holder to operate without a program as required in section 121.629(c). If the operator does not have an FAA-approved deicing/anti-icing program, section 121.629(c) prohibits an air carrier from “dispatch, release, or takeoff” of an aircraft in ground icing conditions.

NOTE: Principal operations inspectors (POI) may refer to AC 120-60, Ground Deicing and Anti-Icing Program, for a detailed description of those elements that make up the program.

B. Provisions and Exceptions. An exception to the requirements for a complete deicing/anti-icing program is contained in section 121.629(d), which provides that an air carrier is not required to have an approved deicing/anti-icing program if an outside the aircraft check (OTAC) is completed within 5 minutes prior to beginning the takeoff. An OTAC must be performed from outside the aircraft to ensure that “wings, control surfaces, and other critical surfaces are free of frost, ice, and snow” when the certificate holder is operating in ground icing conditions. If a certificate holder chooses to operate in accordance with section 121.629(d), the requirement for an OTAC must be documented in its operations specifications (OpSpecs).

1689. PART 121 DEFINITIONS.

A. Pretakeoff Check. A pretakeoff check is a check of the aircraft’s wings or representative aircraft surfaces for

frost, ice, or snow within the aircraft's holdover time. This check is required when the certificate holder operates (that is, intends to takeoff) in ground icing conditions, the aircraft has been deiced/anti-iced, and a holdover time is established. This check is accomplished within the holdover time range, and is normally accomplished by the flightcrew from inside the cockpit. The pretakeoff check requires the flightcrew to check the aircraft's wings or representative aircraft surfaces for contamination as well as to assess the current weather or other situational conditions. The pretakeoff check is integral to the use of holdover times; if holdover times are used, at least one pretakeoff check must be performed.

B. Pretakeoff Contamination Check.

(1) A pretakeoff contamination check is a check that the flightcrew and ground personnel conduct after the holdover time has been exceeded to make sure that the wings, control surfaces, and other critical surfaces, as defined in the operator's program, are free of frost, ice, and snow. The pretakeoff contamination check must be completed within 5 minutes before beginning the takeoff. Operators must have aircraft-specific procedures for use by flight crewmembers and qualified ground personnel while conducting the check to ensure that the aircraft's wings, control surfaces, and other critical surfaces remain free of frost, ice, or snow when a holdover time has been exceeded.

(2) The pretakeoff contamination check must be conducted from outside the aircraft for the following:

- Hard wing airplanes with aft, fuselage mounted, turbine powered engines

NOTE: The check for these airplanes must include a tactile check of selected portions of the wing leading edges and the upper wing surfaces. Alternatives to a tactile check may be approved only with concurrence of the manager of the Flight Standards Air Transportation Division, AFS-200.

- All other airplanes unless the operator shows that the check can be adequately accomplished from inside the airplane. POIs may refer to AC 120-60 for additional guidance.

C. Outside the Aircraft Check (OTAC). An OTAC is a check that must be accomplished from outside the aircraft. Section 121.629(d) requires an OTAC of a certificate holder who operates in ground icing conditions without an approved part 121 ground deicing/anti-icing program. For those operators without an approved program, any time frost, ice, or snow may reasonably be expected to adhere to the aircraft, an OTAC must be performed to ensure that the wings, control surfaces, and other critical surfaces are free of contamination. An OTAC must occur within 5 minutes prior to beginning the takeoff.

D. Holdover Time. Holdover time is the estimated time deicing/anti-icing fluid will prevent the formation of frost or ice, and the accumulation of snow on the treated surfaces of an aircraft. Holdover time begins when the final application of deicing/anti-icing fluid commences and expires when the deicing/anti-icing fluid applied to the aircraft loses its effectiveness.

1691. PART 121 GROUND DEICING/ANTI-ICING PROGRAM. In order for the certificate holder to have an approved ground deicing/anti-icing program that complies with section 121.629(c), each operator's ground deicing/anti-icing program must cover the following four areas as described in AC 120-60:

- Management plan detailing operational responsibilities and procedures
- Holdover timetables and procedures for their use
- Procedures and responsibilities for the following:
 - Aircraft ground deicing/anti-icing
 - Pretakeoff check
 - Pretakeoff contamination check procedures
- Initial and recurrent ground training and/or testing for flight crewmembers and qualification for all other affected personnel, as applicable

1693. MANAGEMENT PLAN. The operator should develop, implement, and use a management plan to ensure proper execution of its approved deicing/anti-icing program. The management plan should include operations and maintenance responsibilities and identify the management positions that are responsible for ensuring that all necessary elements of the deicing/anti-icing program are properly executed.

1695. HOLDOVER TIMETABLES AND THE PROCEDURES FOR THEIR USE.

A. Holdover Timetables. Each operator is required to develop, and have available, holdover timetables for use by its personnel. In addition, each operator must make its holdover timetables available for use in the cockpit. These timetables are required to be supported by data acceptable to the Administrator. Currently, the only acceptable data is that developed by the Society of Automotive Engineers (SAE) and International Standards Organization (ISO). ARP 4737, "Aircraft Deicing/Anti-Icing Methods with Fluids, for Large Transport Aircraft," and ISO 11076, "Aerospace - Aircraft Deicing/Anti-icing Methods with Fluids," contain the tables that are currently considered acceptable for use by the operators to develop their timetables.

NOTE: POIs may refer to AC 120-60 for additional guidance regarding the development of procedures for increasing or decreasing determined holdover times.

B. Takeoff Within a Holdover Time. If takeoff is conducted within the holdover time, section 121.629(c)(4) requires at least one pretakeoff check of the wings or representative surfaces to be completed by the flightcrew within the holdover time range prior to the takeoff. Operators' manuals should contain detailed procedures regarding the use of the timetables in their operations. Section 121.629(c)(3) requires that the operator's program contain procedures for the flight crewmembers to increase or decrease the determined holdover time in changing weather conditions.

C. Takeoff After the Holdover Time is Exceeded. Under section 121.629(c), takeoff after the holdover time is exceeded is permitted only if one or more of the following actions has been taken:

- A pretakeoff contamination check is made to ensure that wings, control surfaces, and other critical surfaces, as defined in the certificate holder's program, are free of frost, ice, or snow
- It is otherwise determined by an alternative procedure, which was developed by the operator and approved by the FAA (for example, wing icing sensors) that the wings, control surfaces, and other critical surfaces as defined in the certificate holder's program, are free of frost, ice, or snow
- The wings, control surfaces, and other critical surfaces have been redeiced and a new holdover time has been established

1697. PART 135 GROUND DEICING/ANTI-ICING TRAINING AND CHECKING RULE.

A. General. Section 135.227(a) prohibits a pilot from taking off in an aircraft that has "frost, ice, or snow adhering to any rotor blade, propeller, windshield, wing, stabilizing or control surface, to a powerplant installation, or to an airspeed, altimeter, rate of climb, or flight attitude instrument system...." As evident by the use of the term rotor blade, helicopters are subject to the regulation. There are two exceptions to the regulation:

(1) Section 135.227(a)(1) allows that "takeoffs may be made with frost adhering to the wings, or stabilizing or control surfaces, if the frost has been polished to make it smooth."

(2) Section 135.227(a)(2) allows that "takeoffs may be made with frost under the wing in the area of the fuel tanks if authorized by the Administrator."

B. Provisions in part 135 Ground Deicing/Anti-icing Rule. Section 135.227(b) requires pilot training in accordance with section 135.341 if a certificate holder is going to operate (that is, takeoff) "any time conditions are such that frost, ice, or snow may reasonably be expected to adhere to the airplane..." (ground icing conditions). In addition to pilot training, section 135.227 requires a pretakeoff contamination check (see paragraph 1699 of this section). Therefore, if the certificate holder is operating in ground icing conditions, it must have a pilot training program, which the pilot has completed, in accordance with section 135.341, and the pilot must conduct a pretakeoff contamination check. Exceptions to the regulation that requires a pretakeoff contamination check when operating in ground icing conditions are as follows:

(1) Alternative procedure - the Administrator may approve an alternative procedure developed by the operator to ensure the wings and control surfaces are free of contamination (for example, wing ice sensors); or

(2) The operator may comply with the part 121 ground deicing rule.

C. Important Differences Between the part 121 Ground Deicing Rule and the part 135 Ground Deicing Rule. When compared to the part 121 ground deicing regulation, the part 135 ground deicing rule differs in the following respects:

(1) Only pilot training and checking is required to be conducted in accordance with section 135.345(b)(6)(iv).

(2) The use of holdover times and tables when operators use deicing/anti-icing fluids is only advisory in the part 135 ground deicing rule.

(3) A pretakeoff contamination check must be performed whenever a part 135 certificate holder is operating in ground icing conditions.

1699. PRETAKEOFF CONTAMINATION CHECK. A pretakeoff contamination check is a check to make sure the wings and control surfaces are free of frost, ice, or snow. Section 135.227 requires that a pretakeoff contamination check be completed within 5 minutes prior to beginning the takeoff. It may be accomplished from inside or outside the aircraft and may be visual, tactile, or a combination, as long as the check is adequate to ensure the absence of contamination. The operator's POI must approve the pretakeoff contamination check procedures for each specific type of aircraft operated by the certificate holder. Also, the operator's OpSpec A023 or A041, as applicable, must reference or describe the pretakeoff contamination check.

1701. APPROVALS FOR PART 135 OPERATORS. If a part 135 operator chooses to use a ground deicing/anti-icing program (121.629(c)), the POI will issue OpSpec A023 to approve that program. If a part 135 operator chooses not to use a ground deicing/anti-icing program, the POI will issue OpSpec A042. The POI will authorize a Pretakeoff Contamination Check by issuing OpSpec A041, in accordance with section 135.227. (See FAA Order 8400.10, Air Transportation Operations Inspector's Handbook, Volume 3, Chapter 1, Section 3, for guidance on issuing OpSpecs.)

1703. APPLICABILITY OF THE PART 135 GROUND DEICING RULE.

A. Certificate Holder Who Does Not Operate in Ground Icing Conditions. The part 135 ground deicing rule does not apply to a certificate holder who does not operate in ground icing conditions. Under the regulation, ground icing conditions exist any time weather conditions are such that frost, ice, or snow may reasonably be expected to adhere to the airplane. The certificate holder who does not operate in ground icing conditions is not required to train its pilots or develop pretakeoff contamination procedures. Certificate holders who do not operate in ground icing conditions must be issued OpSpec A042.

B. Operators Who Use Only One Pilot in Their Operations. Operators who use only one pilot in their operations (single pilot operator) are not required to comply with the manual and approved training requirements of section 135.21 or section 135.341. Therefore, single pilot operators are not required to have an approved pilot training program nor the additional training required by the part 135 ground deicing rule. However, single pilot operators must comply with all the operational requirements of the part 135 ground deicing rule. Those operational requirements include a pretakeoff contamination check or an approved alternative procedure to the pretakeoff contamination check described in its OpSpecs. The pilots of these types of operators will need to demonstrate knowledge to operate in ground icing conditions during the initial and recurrent flight checks. A single pilot operator will have an aircraft-specific description of the pretakeoff contamination check in OpSpec A023 or A041, as applicable. If the operator does not operate in ground icing conditions, OpSpec A042 must be so documented and issued.

C. Helicopter Operations. Helicopter operations conducted under part 135 are excluded from the additional training and pretakeoff contamination check requirements of the Part 135 ground deicing rule. However, the regulation requires helicopter operations to be conducted in accordance with the operating limitations of Section 135.227

1705. TRAINING REQUIREMENTS OF THE PART 135 GROUND DEICING RULE. If an operator is required to have an approved training program, that training program must include pilot ground training relating to deicing and anti-icing operations required by section 135.345 for initial, transition, and upgrade training and by section 135.351 for recurrent training and testing. These training requirements must include procedures for operating airplanes during ground icing conditions. The operator must provide that training to its pilots and all other participating personnel. The training must include at least the following elements:

A. Use of Holdover Times. In part 135 operations, holdover times are only advisory and serve as guidance to the pilot in making takeoff decisions. If the operator uses the

deicing/anti-icing fluids, it must train its pilots in the use of holdover times.

B. Airplane Deicing/Anti-Icing Procedures. Airplane deicing/anti-icing procedures include responsibilities, requirements, and inspections and check procedures for the pretakeoff contamination check or alternative procedures, as applicable.

C. Communications. The operator must provide training for all company personnel in communicating with all agencies involved in the deicing/anti-icing process and the decision making process.

D. Contamination. Aircraft surface contamination training includes how to identify frost, ice, or snow, and how to locate critical areas. Training should include an explanation of how small amounts of surface contamination adversely affect aircraft performance and flight characteristics.

E. Deicing/Anti-icing Fluids. If the operator uses deicing/anti-icing fluids, it must train its pilots, as well as any other participating personnel, in the types and characteristics of deicing/anti-icing fluids.

NOTE: It is important that flightcrews do not use deicing/anti-icing fluids unless they have been trained in the characteristics and effects of these fluids on their operation.

F. Cold Weather Preflight Inspection Procedures. Training should include procedures for cold weather preflight inspections.

G. Contamination Recognition. This aspect of training should cover techniques for recognizing contamination on the aircraft for use during both the preflight inspection and the pretakeoff contamination check.

NOTE: All training should be aircraft-specific. When an operator has different kinds of aircraft, any unique characteristics of these aircraft while operating in ground icing conditions should be covered.

NOTE: Other than part 135 single pilot operators, who must have the pretakeoff contamination check procedures described in their OpSpecs, both part 121 and 135 operators must have documentation in their general manuals (GM) or flight manuals for the procedures they intend to use to comply with their respective deicing/anti-icing rule. These procedures may include descriptions of how and by whom the pretakeoff contamination check will be accomplished, and how the operator will comply with its approved deicing/anti-icing procedures. If an operator elects to not fly when frost, ice, or snow may reasonably be expected to adhere to the surface of an aircraft, that operator's manuals should con-

tain specific guidance to that effect. This guidance should leave no doubt in the minds of the flight crewmembers that this operator does not have deicing/anti-icing procedures in effect and does not authorize takeoff during ground icing conditions.

NOTE: Inspectors should use this handbook section for background material when reviewing those sections of operators' manuals and procedures concerning ground deicing/antiicing.

1707. SOURCES OF INFORMATION. The following publications may be useful to inspectors and operators for developing, reviewing, and approving a ground deicing/anti-icing program.

A. AC 20-117, Hazards Following Ground Deicing and Operations in Conditions Conducive to Aircraft Icing. This AC contains useful background information and also contains an extensive bibliography of related FAA and private sector publications, training materials, and other deicing/anti-icing or related information.

B. Publications of the SAE:

- AMS 1424, "Deicing/Anti-Icing Fluid, Aircraft, Newtonian-SAE Type I"
- AMS 1428, "Fluid, Aircraft Deicing/Anti-Icing, Non Newtonian, Pseudoplastic, SAE Type II"

C. SAE ARP4737. This publication of the SAE contains holdover tables and information on how they are developed as well as information on the inspection of aircraft.

D. ISO Publications:

- ISO 11075, "Aerospace - Aircraft Deicing/Anti-Icing Newtonian Fluids ISO type I"
- ISO 11076, "Aerospace - Aircraft Deicing/Anti-Icing Methods with Fluids"
- ISO 11077, "Aerospace - Deicing/Anti-Icing Self Propelled Vehicles - Functional Requirements"
- ISO 11078, "Aerospace - Aircraft Deicing/Anti-Icing Non Newtonian Fluids ISO type II"

E. AC 120-60, Ground Deicing and Anti-Icing Program. This AC contains information on how operators may develop acceptable ground deicing/antiicing programs to comply with section 121.629(c).

F. AC 135-16, Ground Deicing & Anti-icing Training & Checking. This AC contains information on how operators may develop acceptable ground deicing/anti-icing programs to comply with section 135.227.

G. AC 120-58, Pilot Guide - Large Aircraft Ground Deicing.

H. Computer Based Instruction (CBI) Programs (each Regional Flight Standards Division (RFSD) and each FSDO

has been issued a copy of these CBIs):

- Part 121 Ground Deicing/Anti-Icing Operations, course number 27011
- Evaluating and Approving a Ground Deicing/Anti-Icing Program, a program for 14 CFR part 121 operations
- Part 125/135 Ground Deicing/Anti-Icing Operations, course number 27010.

I. Winter Operations Guidance for Air Carriers. This publication contains a number of ACs and articles relevant to the topic. Specific publications are listed here in case they need to be obtained and used separately:

- AC 91-13, Cold Weather Operation of Aircraft
- AC 65-9A, Cold Weather Suggestions (see chapter 11)
- "Winter Operations," Douglas Aircraft Company
- Air Carrier Operations Bulletin (ACOB) 7-82-2, Cold Weather Procedures
- AC 65-15A, Deicing/Anti-Icing Systems of Aircraft (see chapter 7)
- AC 20-73, Operational Factors (see chapter 2, sections 3 and 4)
- AC 135-9, FAR Part 135 Icing Limitations
- AC 23.1419-1, Certification of Small Airplanes for Flight in Icing Conditions
- FAA-P-8740-24, Tips on Winter Flying, General Aviation
- ACOB 7-81-1, Aircraft Deicing and Anti-Icing Procedures
- FAA Order 8430-1A, Maintenance Bulletins, "Deicing of Aircraft with Engines Operating"
- "Deicing/Anti-Icing Fluids Evaluation," Boeing of Canada, De Havilland Division Dash 8, all operator message No. 48
- "Icing Precautions and Procedures," Boeing of Canada, De Havilland Division Dash 8, all operator message No. 49
- "Wing Upper Surface Ice Detection MD-80," Douglas Aircraft Company Douglas Service, First Quarter, 1990
- "Aerodynamic Effects of Deicing Fluids," Boeing Airliner, Oct. - Dec. 1989
- "Airplane Ground Deicing/Anti-Icing," Boeing Airliner, Oct. - Dec. 1989
- "Deicing/Anti-Icing," Boeing Airliner, Oct. - Dec. 1989.
- "Winter Operations - An Update," Boeing Airliner, Oct. - Dec. 1989
- AC 91-6, Water, Slush, and Snow on the Runway

- ACOB 8-83-1, Effects of Leading Edge Contamination on Aerodynamic Performance
- ACOB 8-83-1, Turbojet Aircraft Engine Icing During Prolonged Operations in Icing Conditions

by manufacturers of deicing/anti-icing products and by aircraft operators. Access to these tapes may be available through the regional deicing/anti-icing coordinator or AFS-500.

NOTE: Numerous video tapes have been produced

1708. - 1738. RESERVED.

[PAGES 4-1067 THROUGH 4-1090 RESERVED]